2004 Command and Control Research and Technology Symposium

The Power of Information Age Concepts and Technologies

SMART SYSTEMS FOR LOGISTICS COMMAND AND CONTROL (SSLC2)

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Cleared for Public Release, Document Number ASC 04-0762.

Report Documentation Page

Form Approved
OMB No. 0704-0188

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1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JUN 2004		**00-00-2004 to 00-00-2004**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Smart Systems for Logistics Command and Control (SSLC2)	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air Force Research Laboratory,AFRL/HEAL,2698 G Street Bldg 190,Wright Patterson AFB,OH,45433-7604**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**		**24**	

Abstract

The US Air Force has a requirement to be aware of the state of its weapon systems and the support equipment within real-time or at least near real-time, however, the means to offer this visibility does not currently exist. The Air Force Research Laboratory (AFRL) has started a new Research & Development (R&D) program to investigate what it would require to meet the warfighter needs. This 6.3 Applied Technology project is called Smart Systems for Logistics Command and Control (SSLC2). The goal of the program is to develop a cross-cutting capability to passively collect critical logistics information required to manage wing level resources, and process it into a form that supports quality decision making by wing level commanders. Additionally, this information should be capable of flowing upward to support daily situational reports at the theater level. The AFRL researchers will take advantage of the successful Logistics Control Information and Support (LOCIS) program. The LOCIS program showed how wing level logisticians can be more productive if fed the status of the wing's logistics resources. Portions of the LOCIS program relied on canned databases during their testing because the means to generate real-time status information did not exist.

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Introduction

The Air Force has a need to know the real-time status of critical logistics assets. Once this information is obtained the entire logistics community will be able to better plan and conduct daily operations or contingency operations with speed and precision. In order to make this happen, the Air Force must research ways for this critical information to be gathered and displayed. The display part has already been researched via the Logistics Control Information Support (LOCIS) program. What this program needs to accomplish is the real-time or near real-time feeds for this information to be fed into the LOCIS screens. This program is just getting started, but thoughts of how this information could be made available have been discussed over years within the Logistics Readiness Branch of the Air Force Research Laboratory.

Technical Approach

The Smart Systems for Logistics Command and Control (SSLC2) needs to collect this information near real-time in order to provide decision makers with better critical logistics resource information. Better information leads to better quality and timely status information and this can be done with a great deal less effort and cost than the current practices. The Air Force has various data base systems to collect and display logistics information, however, none of these data bases collect and display in near real-time data. Also they do not have the ability to collect this information passively. Currently, these data bases are fed via manual entry from Airmen that receive the information via telephone, email, or radios from the various groups that know the status information. This is time consuming, can lead to inaccuracies, and the data is only as

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good as the last phone call. These entries are prone to errors, for every 300 keystrokes there exists one error (Reboulet, 2003). This data is not timely either; for example, the Core Automated Maintenance System (CAMS) data base is usually updated at the end of the day's shift and then batched from the various locations. Depending on the time of day this data could be over 20 hours old.

Logistics Command and Control Information Support (LOCIS)

The LOCIS program was successful at gathering and displaying logistics command and control data to the logistics stakeholder (Hardenburg and Curtis, 2000, 2001). Part of the LOCIS program utilized canned data bases to update status information. The goal of this research is to passively collect data and use that to feed the LOCIS or other existing logistics command and control program.

Smart Systems for Logistics Command and Control (SSLC2)

This research is a 6.3 advanced technology demonstration program sponsored by the Air Force Research Laboratory. The program is planned to run from FY04 through FY07 at a cost of $3.75M. The program will utilize spiral approaches building modular design segments that would allow for transition to the various users at the end of each spiral. In spiral one, the prime contractor, GRACAR Corporation, will lead the SSLC2 team in developing the requirement for the warfighter. The team will utilize cognitive task analysis (CTA) (Militello and Quill 2003) tools and perform analysis of alternatives to identify the data-inputting tasks required for existing logistics systems. A Concept of Operations (CONOPS) will be developed for logistics data collection addressing the

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needs of the warfighter. These CONOPS will be outlined in storyboard presentations to the user. Feedback from the user will help determine the focus of work in subsequent spirals. Next, preliminary software demonstrating passive data collection and automated data aggregation will be developed. This demonstration will provide an example taking data from the flightline, combining it with existing logistics data, and producing useful logistics summary information. Each spiral will produce a refined product that can be demonstrated in an operational field setting. The software will demonstrate the ability to produce decision quality logistics information from large amounts of lower-level data that will be useful for wing level and theater level applications. This will be the ultimate deliverable of the program.

Passive Data Collection

The passive data collection techniques include voice recognition, automatic identification technologies, Radio Frequency Identification (RFID), sensors, software agents, and data mining. Under this effort, voice recognition technologies will be further advanced by making them more robust and pervasive, in order to capture all key logistics data elements.

End User

Multiple end users are anticipated; such as 1) a Production Superintendent who requires real-time information of parts in the supply chain, 2) the Maintenance Operations Center (MOC) Controller which requires knowledge of the status of fuels, munitions, and transportation assets, and 3) the Command Post Personnel will have a

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system that displays real-time critical information that will allow a central point for all interested parties to obtain the "pulse" of the wing. The user that will be focused on in each of the spirals will be developed during the requirements identification period.

End State Objectives

The following are the end state objectives of the program:

- Improvement to the currency, accuracy, and completeness of logistics data available to decision makers through passive capture and integration of information not currently available in legacy logistics information systems;
- Significant reduction in time and effort required to gather, store, retrieve, and manage data across the logistics information chain;
- Aggregation of logistics data into decision-quality information;
- Organization and presentation of the logistics information in a manner that supports decision makers in their ability to quickly draw reasoned and actionable conclusions;
- Automation of the flow of critical logistics information from the flightline to wing and theater level decision makers.

These objectives will be accomplished by applying the appropriate passive data collection technologies and other Automatic Identification Technology that are planned to be employed within the Air Force to capture this critical logistics information. This information includes: where the item is, is it running, is it fully mission capable, if broke how long will it take to repair, if fuel and lubricants are on-board how much remains, and

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does the system require refueling. Identifying these areas will enable the ordering parts and dispatching of maintenance personnel to fix discrepancies.

Near Time Status of Logistics Pieces

The logistics pieces that will be tracked and status provided for during the program includes, as a minimum: petroleum, oil, and lubricants (POL) levels, Mission Capable (MICAP) parts visibility, number of 463L pallets, nets, and devices on-hand. Other critical logistics pieces will be analyzed during each spiral and may be added to the program.

Benefits

The following benefits can be realized through the implementation of the SSLC2 technologies and business process improvements: 1) significantly improving currency, accuracy, and completeness of logistics data, 2) greatly reducing man-hours required to gather, store, retrieve, and manage the data, and 3) provide critical logistics information in a decision-quality format.

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SMART SYSTEMS for LOGISTICS COMMAND and CONTROL

(Jun 2004)

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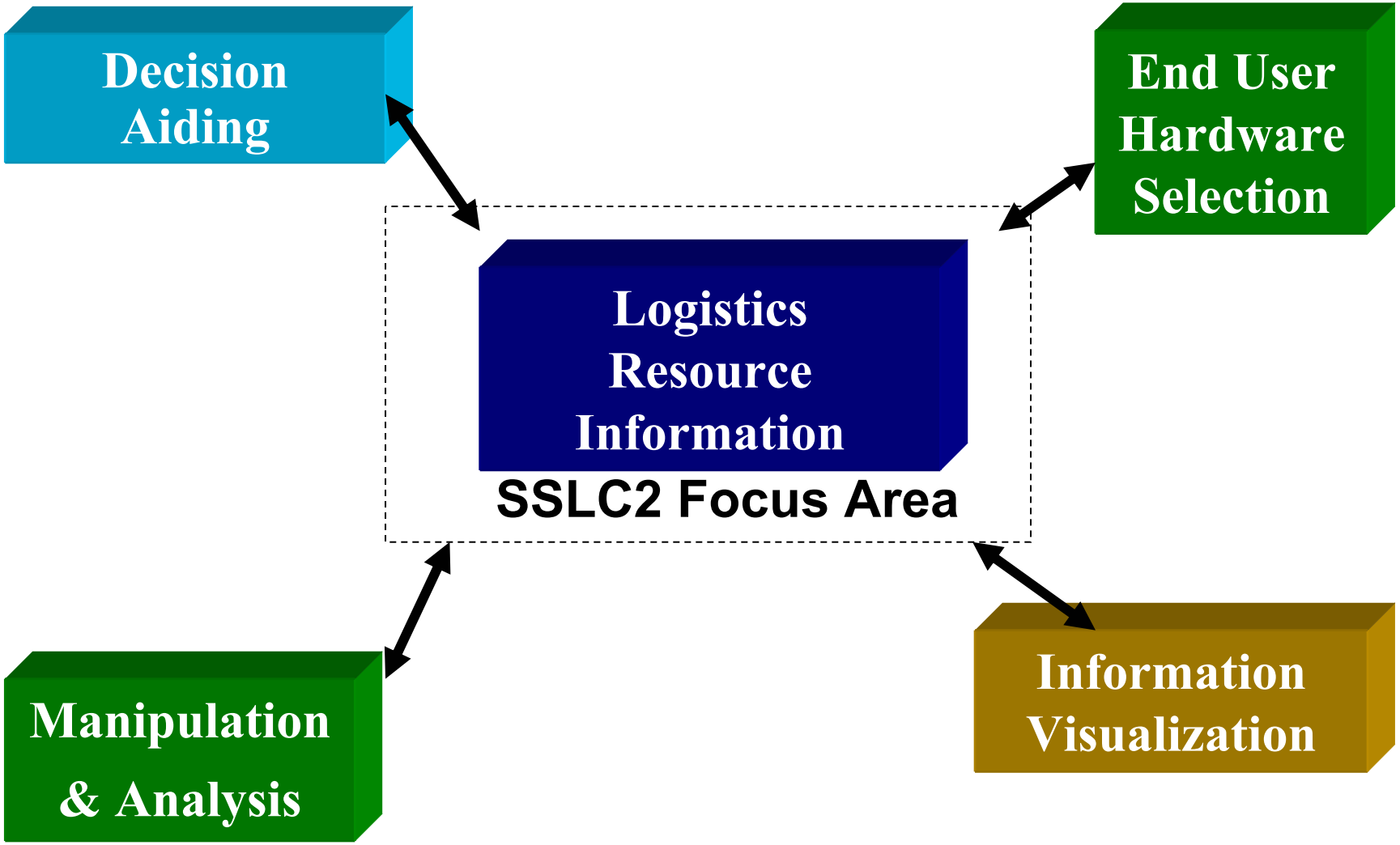
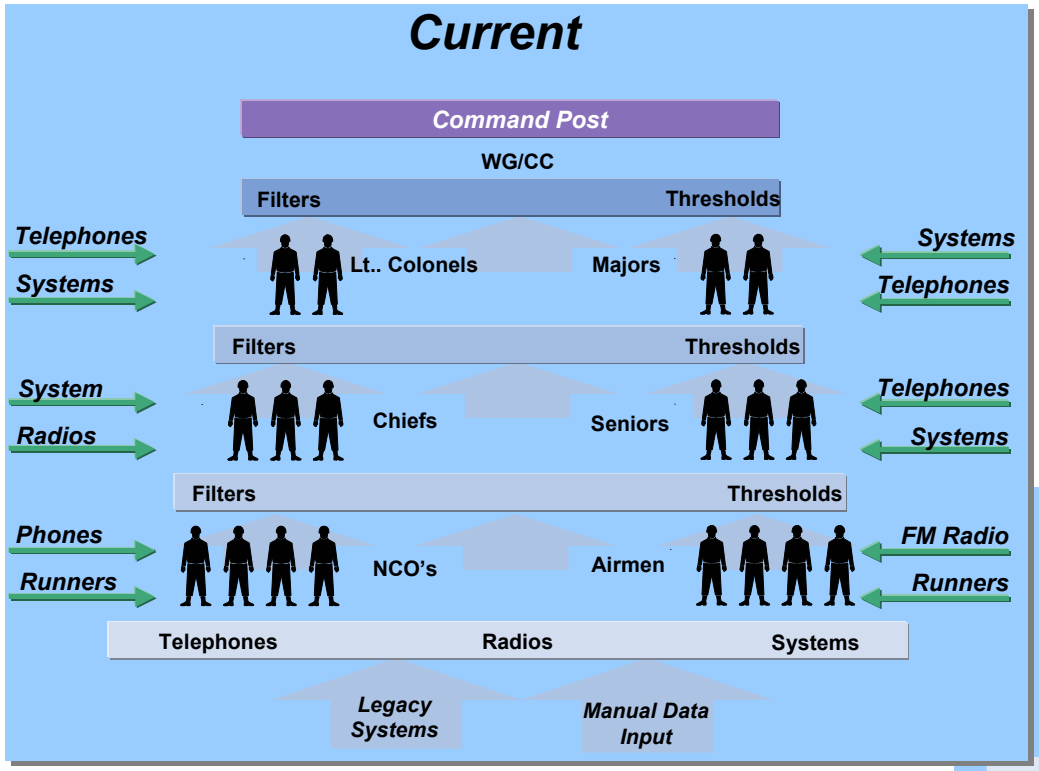
Cleared for Public Release AFRL-WS-04-0038

Logistics C2 Research Areas

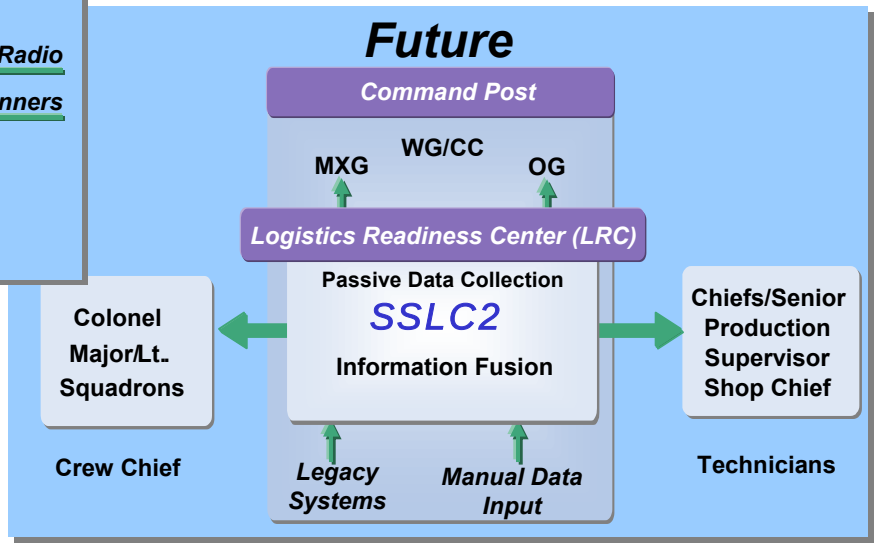


Problem



Warfighters need to know the state of readiness of warfighting resources beyond the state of repair of individual assets.

- **Petroleum, oil, and lubricants (POL) levels**
- **Mission Capable (MICAP) parts visibility**
- **Number of 463L pallets, nets, and devices on-hand.**



SSLC2 benefits:

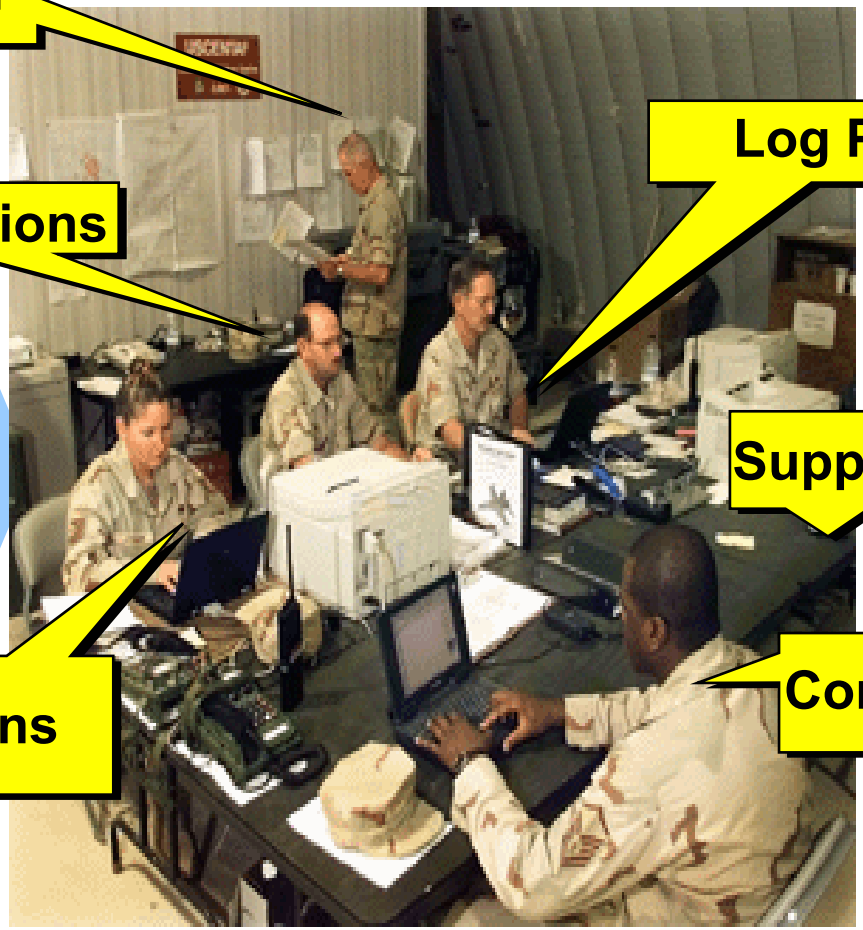
- Reduce manual data entry
- Eliminate duplication
- Increase data accuracy
- Improve timeliness of data

Limitations of the Current Practice Garrison Environment

- **Manual and duplicative entry into multiple databases**
  - **Current operations have limited technologies and rely on Access® and Excel® as their database tools**
- **Manual entry leads to data inaccuracies and problems with timeliness**
- **Most information contained in databases is on average eight hours old**

Limitations of Current Practice Contingency Environment

- Center designed to provide info on logistical status & operational impact to weapons systems
- Manpower intensive group
- Gets info manually through phone/fax/email
- Not typically proactive and relies on lagging indicators to display status



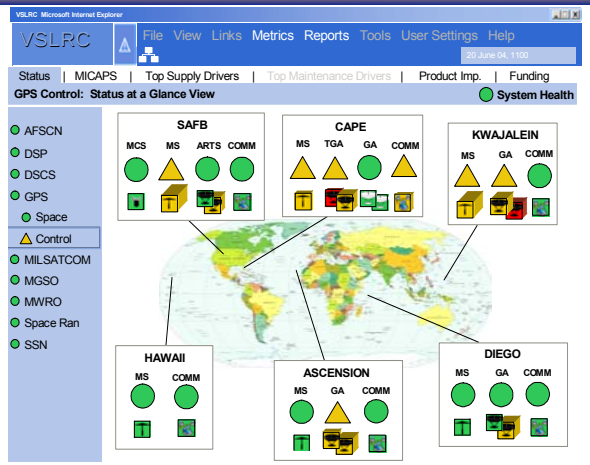
SSLC2 Goal

- Improve Logistics Command and Control business decision-making
  - Transfer of critical information is slow, inaccurate, and requires significant time and effort to collect, organize and display
- How:
  - Develop complex computer algorithms
  - Create advanced decision support tools for capture of business decision-making rules
  - Enable passive data collection technologies
  - Stimulate and simulate “as-is” and “could-be” business process changes and assess those improvements

SSLC2 Technical Approach

Presentation Layer

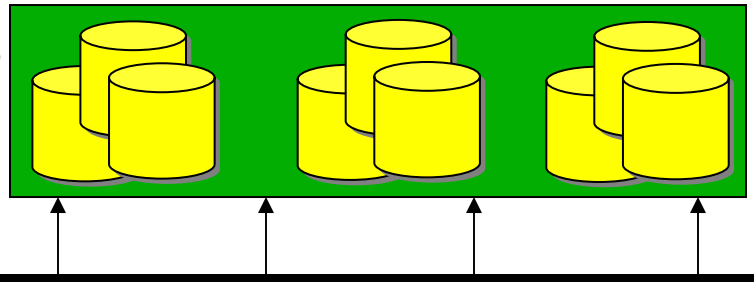
Stimulate and simulate "as-is" and "could-be" business process changes and assess those improvements



Integrating Information for Effective Presentation

Complex Computer Algorithms

Legacy Logistics Information Systems

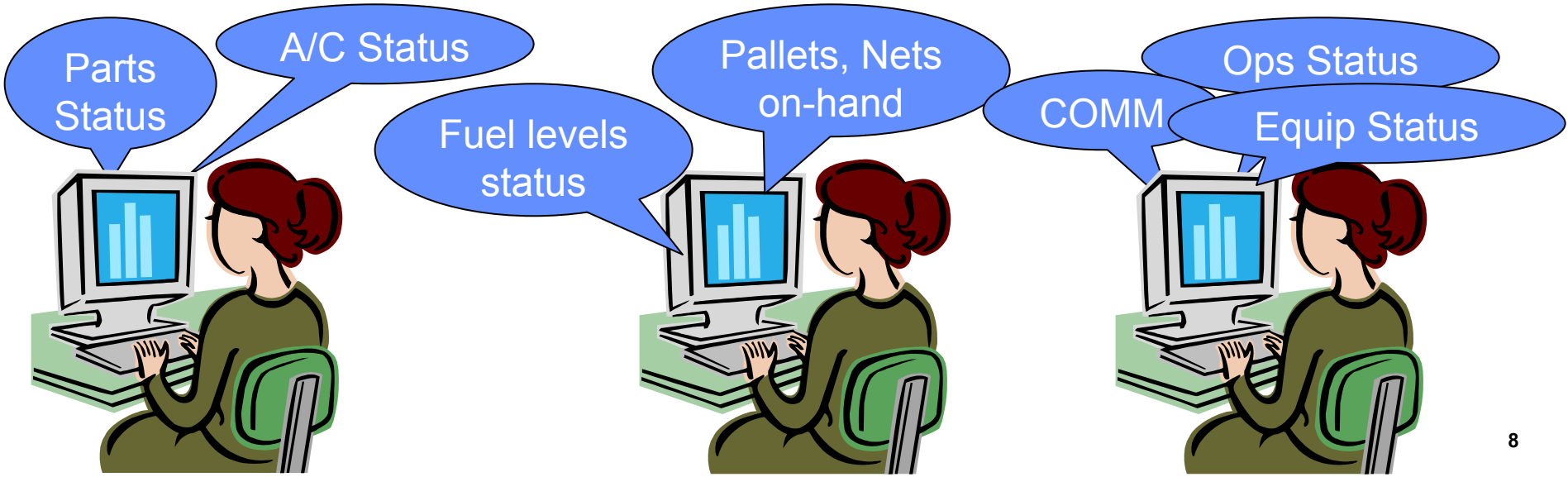


SSLC2 Researching the Infrastructure Improvements for Timely C2 Information

Passive Data Collection Technologies **Capture Business Decision-Making Rules**

SSLC2 Vision

"Timely C2 information supports better decision-making"



Potential End-Users

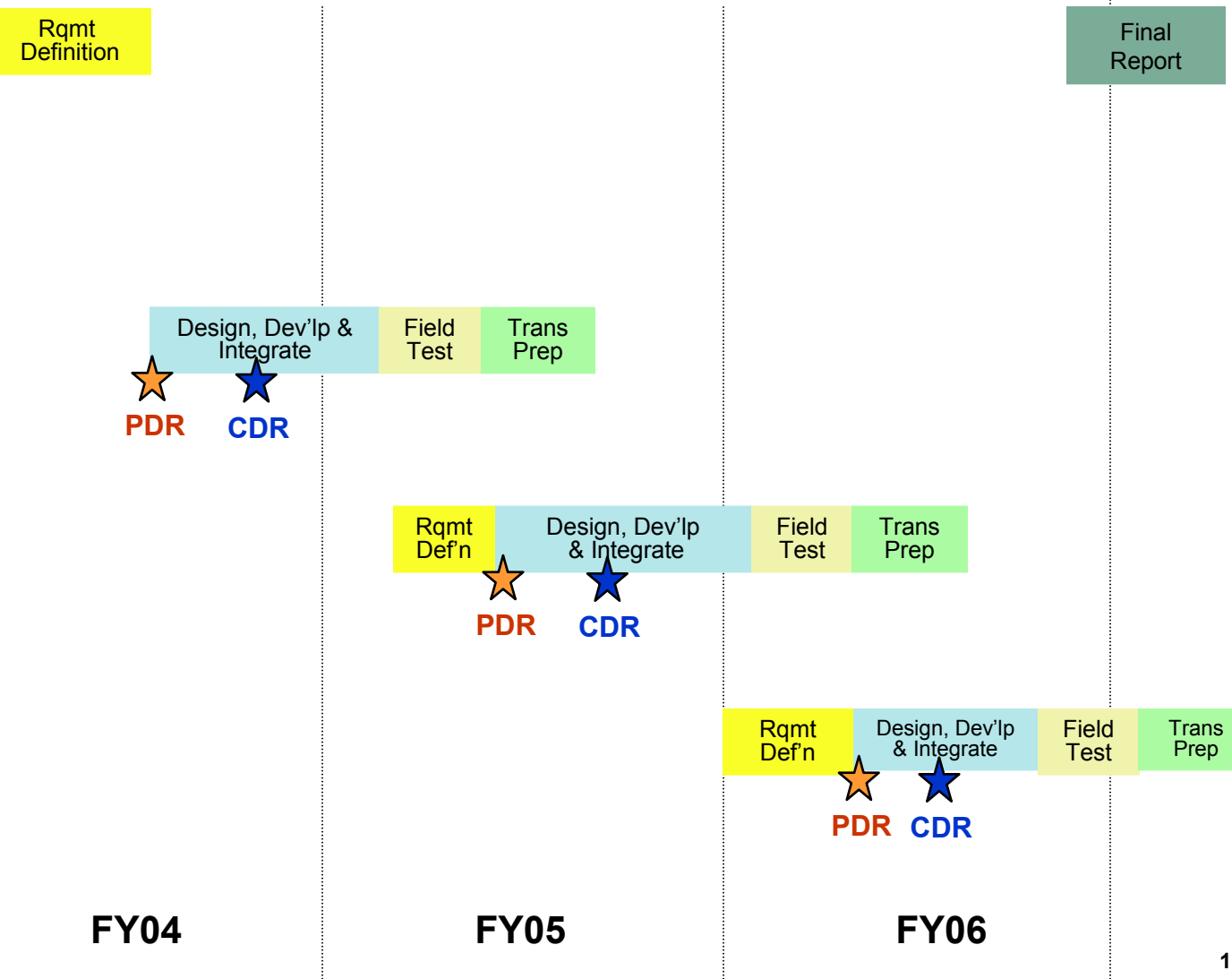
Base Level:

- Command Post Personnel
- Functional Supervisors

Commander Level:

- Wing Level (Squadron, Group), Battle Staff, Crisis Action Team
- Above Wing Level – MAJCOM, HHQ, AOC, LRC, A-4, J-4

Project Schedule



AFRL Risk Abatement

- Build on key Lessons Learned from previous AFRL efforts:
  - Early & Continuous Involvement of the warfighter
  - Establishment of User Groups – realistic feedback
  - Trade Shows participation – invaluable lessons learned
- Requirements defined by users for every spiral
- Pass/fail user defined metrics
- Modular design options

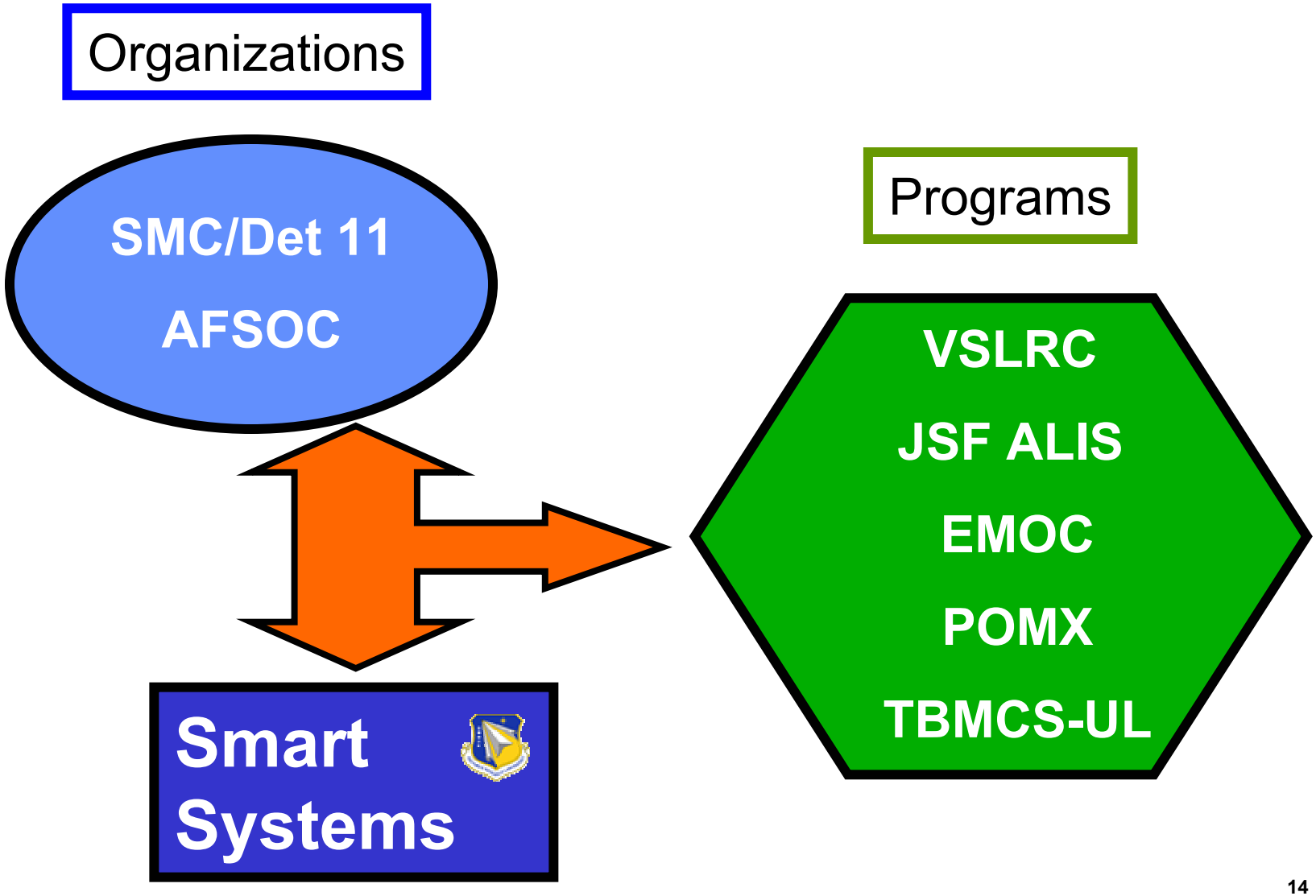
AFRL Risk Abatement (continued)

- Awareness of key development projects:
  - AF Portal
  - GCSS-AF
  - TBMCS-UL
  - Enterprise Data Warehouse
  - Logistics Enterprise Architecture
  - Early identification of Transition Agents

Collaboration Partners

- AF-ILMM
- AMC/A-4
- AFC2ISRC
- AFMC LSO/LOA, AF AIT Program Manager
- AFC2 Battlelab & AFAEF Battlelab
- AFSPC
- AFRL Information Directorate
- DARPA
- TBMCS-UL

Potential Transition Partners



Summary

By achieving the Smart Systems goal:

Develop and/or leverage technology to passively collect the critical information required to effectively manage logistics resources in support of combat operations.

Smart Systems will:

- Improve the currency, accuracy, and completeness of data
- Improve the effectiveness of gathering, storing, retrieving, managing, and structuring data
- Improve the value of logistics data sent to higher headquarters for use in theater-level C2

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